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THE DEFENSE-ZONE PLAN OF BARKBEETLE CONTROL

by J.C. Evenden

A spreading epidemic of the mountain pine beetle in lodgepole seems to be a definite procession. First there are the scattered individuals and small groups of infested trees. These give way to larger groups which in turn develop into practically solid blocks of infestation. The length of this procession varies from a few to several miles, depending apparently on the available timber stands. Each year the individual trees and small groups push ahead into new areas, while the larger groups and solid areas move forward to occupy the ground vacated by the advance guard.

The defense-zone plan of attack is an application of our methods of control in a manner which is applicable only to an epidemic that annually spreads into new territory. In brief, it consists of a zone or area established across the head of a spreading epidemic in which the invading infestation is treated each year until such time as

the source of such an encroachment no longer exists. There are so many objections to this plan that its adoption can be justified only as a last resort. Regardless of these objections, it offers the only possibility of stopping the spread of an epidemic that has reached such magnitude that funds are not available for the treatment of all or even a large percentage of the infested trees in any one or two seasons.

This plan of attack was first instituted in District 1 on the Missoula National Forest in 1924. Its objective was to check the spread of the mountain pine beetle epidemic that since 1910 had been extending south along the west side of the Continental Divide. On this occasion the plan was not thoroughly tested, for during the summer following the inauguration of control it was found that our zone of defense was many miles behind the head of the infestation. In 1925 a new zone was established farther to the south on the East Fork of the Bitterroot River. In 1926 this zone was extended to include the Big Hole Basin. During the past season, because of the shortage of funds available for control, it became necessary to give up the Bitterroot portion of the defense zone in an attempt to hold the Big Hole Basin, which was believed necessary to check the southern spread of the epidemic. It is of course understood that in the application of this plan to the Big Hole Basin Control Project it is not directed toward the protection of the timber within the Big Hole, but to checking the spread of this infestation into the more valuable stands lying to the south.

In theory this plan seems entomologically sound. If the zone of defense is of sufficient area to include all invading beetles, and all infested trees are treated yearly until the epidemic in the rear has ceased to exist as a source of supply, then the plan should be successful. Though it seems sound and feasible, there are many objectionable features that must be considered and that make of it a last-stand operation only. In the adoption of the defense-zone plan of attack a reduction in the cost of the operation cannot be expected. Instead of treating all the trees in one year the work is distributed over several, for at some time in the operation all the insects will of necessity pass into the zone of defense and be treated. In addition to the cost being the same, the loss of timber is far greater, for the insects as they approach the defense zone are killing new trees each year. Of course during this period there might be a decline in the severity of the outbreak, due to natural agencies, that would greatly lessen the cost of control. On the other hand, there might be an increase in the infestation, which would have the opposite result. The adoption of any plan of attack based upon the expectation of securing assistance through natural agencies is but a gamble. A policy practically as safe and far more economical would be to forego entirely control work, on the chance that Nature would stop the outbreak--which she does sometimes!

To treat the infested trees within a zone of defense thrown across the head of such an infestation of the mountain pine beetle as we have been discussing would not be an extensive operation for a year or two; but as the beetles from the large groups and solid blocks began to invade the area, large sums of money would be required. If this money is available and the area is successfully held for a few years

against the invading forces, the infestation will begin to decrease, but the large expenditure of money must be expected and prepared for. I am a firm believer in the efficacy of our control measures. I believe we reap from our operations exactly what we sow. If we spend but one dollar where ten are required, we need not expect dividends from more than our investment. The defense zone of control must be considered merely as a last resort--a final whirl at fighting an epidemic that has left in its wake a devastated forest and that promises to continue its destruction. It is but paying the purchase price with interest on the installment plan, with the possibility of losing our previous payments because of our inability to meet the yearly assessments.

Though there are a number of circumstances which impair the efficiency of this plan of attack, I can see one justification for it. If the spread of an infestation threatens valuable timber stands that warrant the expenditure and it is impossible to secure sufficient funds to clean up the outbreak in a year or so, then, if funds be available for its maintenance, the plan is justified as a fighting chance.

ENTOMOLOGY INSTRUCTION AT RANGER SCHOOL

Twenty-six rangers of District 5 assembled at the Feather River Training Camp in October for a month's instruction in all the forestry subjects with which they come in contact. The course of study is a well-rounded one, covering about every phase of forestry work, and is one that every forester would be glad to take if he had the chance. October 14 was given over to forest entomology, Mr. Keen giving the instruction this year. In the classroom work during the morning the general field of entomology as related to forest practice was covered, and the rangers advised how to distinguish the important tree-killing beetles and how they can be controlled. In the afternoon the class was taken into the field and given instruction in spotting infested trees and in making surveys and estimates of damage. The rangers took a keen interest in the work, as they are more and more frequently being called upon to deal with forest insect problems.

MOUNTAIN PINE BEETLE LOSS HEAVY IN CENTRAL IDAHO

For several years we have known of losses occurring from the attacks of the mountain pine beetle throughout the central portions of Idaho. In 1926 the reports we received seemed to indicate that there was a quite definite though not alarming increase in the number of red-tops throughout the region. However, it seems that the season of 1926 was an extremely favorable one for the increase of this infestation, for this year the discolored foliage of the trees from last year's attack seems to be everywhere. On the Salmon and Challis National Forests one can see miles and miles of red-tops, and forest officers state that the same condition exists in the Boise, Idaho and Payette Forests. Though as yet this infestation does not occur in the solid blocks of infested trees that one can see in connection with the Bitterroot infestation, it covers a tremendous area, and in a year or two can develop into the same class of epidemic that we now have in the Bitterroot National Forest. J.C.E.

BEETLES LOSE APPETITE FOR SCORCHED TREES

There is considerable evidence to show that fires attract beetles, and that the first effect of fires is to concentrate beetles in the vicinity of burns, with the result that the fire loss is greatly augmented by the subsequent beetle-killing of fire-weakened trees.

A study of a fire that occurred on Timber Mountain,, Modoc National Forest, in July 1924, shows this same result, but goes farther in demonstrating that when the surviving trees recover from the effects of the fire and put on increased growth they become less susceptible to beetle attack, and the beetle losses on the burned area diminish.

On the Timber Mountain burn the first effect of the fire was to bring about a concentration of infestation in the fire-weakened trees and also to mass the beetles in the standing green trees immediately surrounding the burn. Then with the death of most of the fire-weakened trees and recovery of the vitality of the survivors, the infestation decreased within the burn more rapidly than on the areas adjacent to it.

Two adjoining 80-acre plots, one within the burn and one just outside, were completely cruised and all trees, both green and standing dead, were marked and classified. A summary of the losses on the two plots is as follows:

No. of Trees	Burned Plot	Unburned Plot
Killed by fire 1924	522	0
" beetles 1925	140	40
" " 1926	271	178
" " 1927	106	162
Total loss to date	1039	380
Green trees left	530	1250
Total trees on plots	1569	1630

From the above it will be noted that for the first two years after the fire the infestation on the burned plot was particularly high, much higher than on the adjacent unburned plot; but in 1927 the infestation decreased on both plots but made a much more pronounced drop on the burned plot than on the virgin untouched stand. This can be explained as due largely to the release from suppression of the surviving trees on the burned plot and to the removal of a high percentage of slow-growing and beetle-attractive trees. From now on for many years to come the beetle killing on the burned plot can be expected to be decreasingly severe. However, as a method of reducing beetle losses such a remedy is obviously worse than the disease. F.P.K.

[illegible] PINE-MOUNTAIN PINE BEETLE STUDY

A backward and stormy spring resulted in a handicapped start of the work in connection with the intensive studies of the mountain pine beetle which are being conducted on the East Fork of the Bitterroot River. In Mr. Gibson's absence Mr. Rust assumed the responsibility for conducting the necessary studies for the continuation of the project.

Mr. Rust secured some very complete and valuable weather and subcortical temperature records. The weather station was maintained all summer, furnishing all the data of such a station and hygrothermograph records of temperature and humidity as well. Daily subcortical records were kept of the bottom and top of beetle-infested logs from early May until mid-July. Air temperatures in the stand and subcortical temperatures on the north and south sides of beetle-infested trees on different sites should furnish some interesting comparisons when worked up.

The arrival in early June of Gibson and Field Assistant Horton, a graduate of the forestry school of the University of Minnesota, together with better weather, rendered it possible to make good headway in the collection of data in connection with the control-tree experiments instituted the previous summer.

The arrival of Dr. Craighead, Dr. Graham and Mr. Evenden in early July greatly sped up the rate of data collecting, both by the increased number of those collecting and by valuable suggestions on the method in use. In mid-July a three-day trip was made by Drs. Craighead and Graham and Messrs. Evenden and Gibson to the Blackfoot drainage on the Missoula National Forest. The purpose of this trip was to discuss the plan of instituting, during the coming season, an ecological study of the insect-depleted lodgepole pine stands of that region. Although considerably handicapped by rain, it is believed that a workable plan was evolved.

The poisoning of twenty beetle-infested trees per week was begun during the first week in August and continued for six weeks to determine whether the insect brood could be destroyed in this manner. A study of the foliage changes that followed poisoning was made of each group. A very ingenious piece of equipment for supplying the poison to the tree was developed. This consisted of a tin can, to the bottom of which was soldered a copper tube outlet. A rubber hose led to a similar tube inserted in a one-inch cork, thus forming a watertight connection from the can to the hole bored in the tree to receive the poison solution. The rapidity with which some of the trees absorbed the solution was surprising. You're wrong! It wasn't a rotten center that caused the rapid absorption.

Early August was spent in studying new attacks, brood conditions and gallery construction, and in performing miscellaneous short experiments. Early September was devoted to a continuation of brood condition study, poison experiments, surveys, foliage change observations, checking sample plots and getting more or less wet almost daily from the unusually rainy weather.

J.C.L.

A RECORD FOR PITCHTUBE'

The longest Dendroctonus pitchtube that has ever come to my notice was the result of a Jeffrey pine beetle attack near Mammoth on the Inyo National Forest. During the seasons of 1926 and 1927 Jeffrey pine beetles around the windfall areas frequently started attacks on thrifty young trees. These trees, because of the vigorous flow of sap which was thrown into the entrance gallery made by the adult beetle, were able to drown out the attack. On one twenty-inch tree where the progress of the attack was watched, the beetles were apparently working overtime to keep the entrances open by building the resinous sap flow into turret-shaped tubes on the surface of the bark. At one entrance the pitchtube was built out practically 3½ inches from the bark surface. Is this a record? J.M.M.

SUCCESSFUL D. VALENS BROOD DEVELOPED IN GREEN YELLOW PINE

On July 13, 1927, while carrying on experimental work with D. brevicomis, a healthy green yellow pine about which was piled D. brevicomis brood bark for an attraction experiment was noted to have several D. valens attacks at the base. Although D. valens frequently attacks green trees, past records indicate that it rarely if ever develops broods. On September 9 1927 this attraction tree was again examined and a brood of quarter to half-grown larvae had developed, killing a small area of cambium at the base. This is perhaps the first record of a successful D. valens brood being developed in healthy yellow pine. G.R. Struble.

DENDROCTONUS BARBERI EPIDEMIC ON PRESCOTT NATIONAL FOREST

During the past summer an epidemic of the southwestern pine beetle (Dendroctonus barberi Hopk.) has developed in western yellow pine on the Prescott National Forest. The infested area is composed of about five sections located just west of the city of Prescott. The timber stand is almost pure 30- to 40-year-old yellow pine, but there are scattering groups of large mature trees distributed over the area.

Most of the infested trees are in small groups, but there are some scattering single trees. The diameters of the infested trees range from eight to thirty inches, with numerous groups having an average diameter of twelve inches. There are at least 1000 infested trees on the area, or an average of 200 trees to the section. On October 1 the broods were in the large larval state in the outer bark.

Direct control work by felling and burning was started by Forest officials during September, 150 trees being treated. Lack of funds stopped the work, but there is hope that a further allotment will provide for a thorough clean-up. W.D.Edmonston.

WHY NOT A WOODPECKER CLUB?

A correspondent recently favored us with this screed, in which he champions the cause of the woodpecker:

"Joaquin Miller, the poet, was filled with the music of the wild and high Sierras and you as an Entomologist can add to this, the practical value of creatures and forces in Nature. It is this practical side I am interested in right now, as my theme is the preservation of woodpeckers, although I would not wax poetic about the vocal supremacy of these birds.

"I was born and raised in the Sierras and my observation of Nature has been that, left alone she will balance herself. When man steps in and destroys birds because they peck his fruit, he is sure to lose his crops or trees from some insect pest that the birds would have destroyed. Now the big yellowhammer or some call it flicker, will eat cherries and on this account I have known ranchers to shoot them in numbers and right now if there were plenty of these birds in the forrests the barkbeetle would not now be devastating in the alarming manner it now is. This bird and other useful woodpeckers should be protected and a severe penalty attatched to the destruction of the same.

"It seems to me, that since these birds are not to be found in flocks as a rule, but are scattered around, and owing to their peculiar habits and active life, it would be difficult to trap a sufficient number to start a farm of them, but could this be done and the hen enduced to lay by removal of the eggs from her nest, that these birds might be raised in sufficient numbers to control the beetle situation. I have noticed these yellowhammers in quite large flocks in the fall of the year. They seem to gather in bunches at this season, although they work singly during the summer. By placing bird houses of the type natural to this bird throughout the forrests they could be kept from migrating, if fed a little. The woodpeckers which nested in our attic have stayed with us three years now and have protected our grove, although the bugs have hit it three times in force.

"The bugs migrate as well as do the woodpeckers and these birds would naturally go where the bugs are thickest. The beetle being only in the bark, is much easier food than a long drill into a dead tree for a grub."

PERSONAL NOTES

A longfelt want at the Coeur d'Alene Station has been filled by the installation as permanent clerk of Miss Jennie Peterson, by transfer from the Forest Service. Miss Peterson has had several years' experience as chief clerk of the Northern Rocky Mountain Experiment Station at Missoula.

An interesting visitor at the Palo Alto Station during the past month was Dr. S. Minkiewicz, Entomologist of the Institute of Agricultural Research at Pulawy, Poland. Dr. Minkiewicz was much interested in our collection of forest insects, especially the barkbeetles, and at his request a number of specimens have been forwarded to him for the Institute's collection.

CURRENT LITERATURE

Beal, J.A. Weather as a Factor in Southern Pine Beetle Control; Jour. For. Vol. XXV, Oct.1927, pp. 741 and 742.

Heavy freeze of January 15 at Asheville, N.C., caused heavy brood mortality. Apparently the only survivors will come from a few eggs that had not hatched at the time of the freeze.

Brues, Charles F. Observations on Wood-Boring Insects, Their Parasites and Other Associated Insects; Psyche, April 1927, Vol. XXXIV, pp. 73-90.

List of insects reared from a pile of firewood stored in a room at Petersham, Mass.; also a philosophical discussion of the origin of wood-infesting insects.

Fracker, S.B. and Granovsky, A.A. Skydusting the Hemlocks; Amer.Forests and Forest Life, V. 33, Oct. 1927, pp. 587-88, 640,ill.

715 acres of hemlock dusted with calcium arsenate from an airplane to control the hemlock spanworm (Ellopia fiscellaria Guen.) in Peninsula State Park, Wis.; cost $5,035.05 or $7.04 per acre. In solid stand mortality of worms was 90-95%, in mixed stand 80% or more.

Heath, Harold Caste Formation in the Termite Genus Termopsis; Jour. Morph. & Physiol., V. 43, No.2, Mar.5,1927, pp.387-419,pls.1,2.

In Termopsis nevadensis only soldiers are produced during the first three or four years. Recently-hatched young disclose no differences other than those of ordinary variation. The first visible signs of caste differentiation appear at a relatively late stage.

Hopping, Geo. R. Studies in the Life History of Trachykele blondeli Mars.(Coleop.); The Can.Ent.,Sept.1927,V. LIX,pp.201-204.

Notes on habits, life history and seasonal history as found at Pender Harbor, B.C.

Wymore, F.H. A Borer (Dinapate wrighti Horn.); Insect Pest Survey Bul., V. VII, Oct. 1, 1927, p. 346.

First report of native palm borer attacking planted fanleaf palms.